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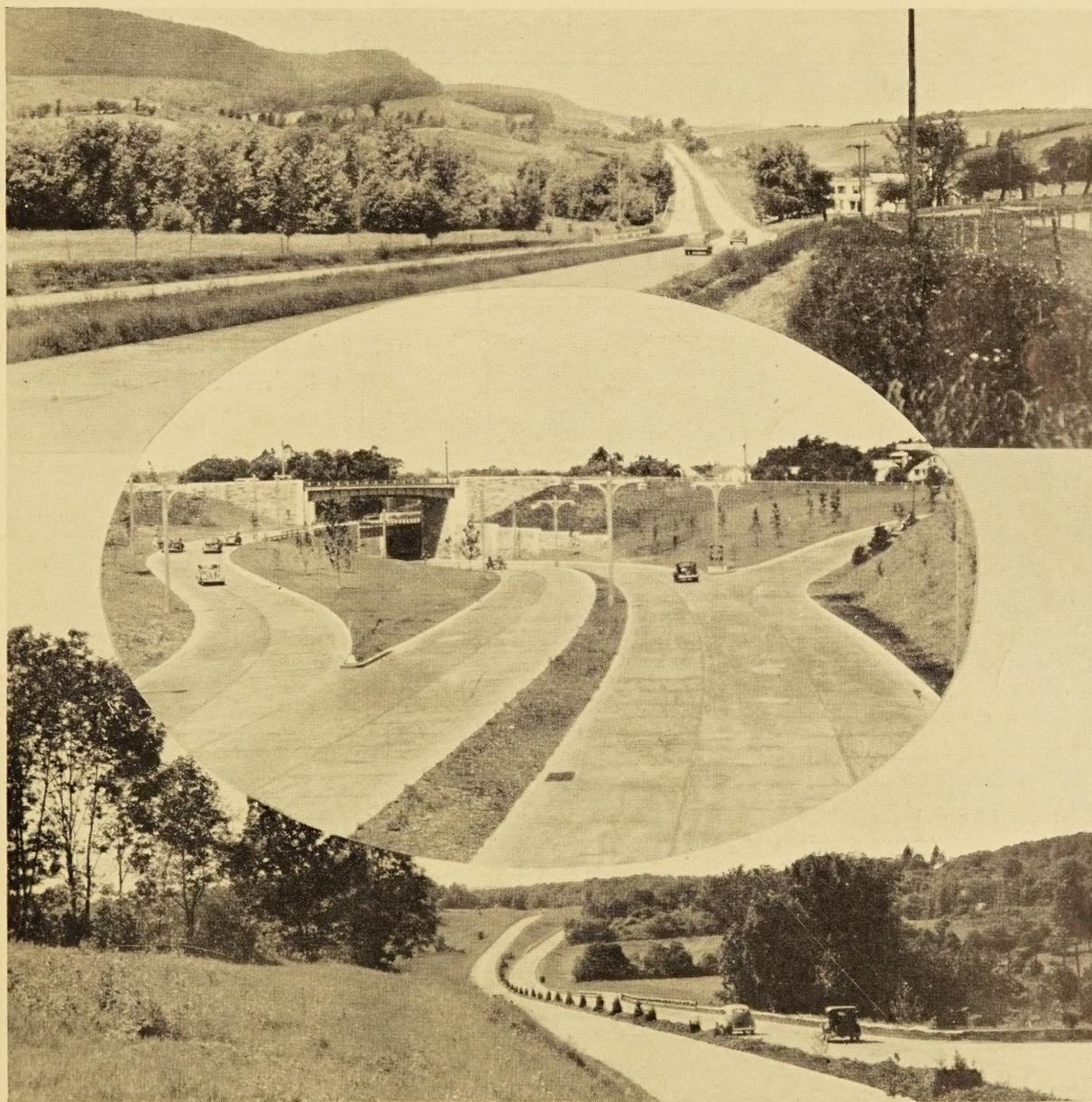
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LAND ACQUISITION IS AN IMPORTANT ELEMENT OF MODERN HIGHWAY CONSTRUCTION



# LAND ACQUISITION FOR HIGHWAYS IN NEW YORK STATE

## A STUDY OF METHODS OF ACQUIRING LAND FOR HIGHWAYS, PARKWAYS, AND GRADE-CROSSING ELIMINATIONS

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**P**UBLIC HIGHWAY authorities in the State of New York are finding that they cannot obtain land for State highway facilities when they need it. When the land is finally acquired, it is found that not enough has been taken, and that too much has been paid for land purchased. An obsolete land acquisition policy threatens to distort the growth of a State highway system which might otherwise enjoy a wholesome development.

To properly implement the creation and modernization of highways and parkways, land acquisition policy must facilitate land assembly at the minimum total cost with a maximum of speed consistent with the preservation of private property rights. To this end, the following are recommended:

(1) A single, efficient method of acquiring lands for highway facilities or for all public purposes should be substituted for the many cumbersome procedures now used.

(2) The right of entry to make locations and surveys ought to be written into the State statutes, as an aid in the construction of public roads.

(3) While the right of entry and possession, granted under the various laws surveyed in this investigation, are perhaps sufficient to expedite the construction of highway facilities, a uniform method granting the right upon notice to the owner of the appropriation, as under the Grade Crossing Elimination and Conservation Laws, is highly desirable.

(4) A centralized State land acquisition department should be created in the New York State Division of Highways, provided with adequate records, and staffed with trained personnel selected under a merit system.

(5) The judicial condemnation mechanism, exemplified by the Highway Law, is cumbersome and costly. The method of forcible acquisition should be revised and modeled after the summary and effective administrative Court of Claims procedure, exemplified by the Grade Crossing Elimination Act.

(6) All court acquisition proceedings should be given a genuine preference over all other civil actions in the setting of times of hearing and trial, so that all such actions may be quickly heard and determined.

(7) While the law permits special benefits to property arising out of public improvements to be offset against consequential damages, in actual practice it is rare that benefits of any kind are taken into account in determining just compensation. The sound public policy of

offsetting benefits against damages should be applied in practice.

(8) Since the financial incapacity of local units is becoming more and more an obstacle in the provision of adequate State highway facilities, the State should finance land acquisition, particularly where improvements are of little local concern.

(9) The device of marginal land acquisition, sometimes identified as "excess condemnation," can be used effectively in New York State, in its highway, parkway, and grade-crossing-elimination programs. It is used but sparingly today.

### THE RIGHT-OF-WAY ACQUISITION PROBLEM

Thirty-seven years ago, the Governor of New York indicated his concern about the public land acquisition practices of that time. "The delays and expense incident to condemnation proceedings have been the occasion of much just criticism. It should be possible

to devise a plan by which the appraisal of the value of land taken for public uses can be made by a permanent body with fixed compensation. This would be in the interest of economy and dispatch, and would tend to put an end to the abuses which have too frequently existed in the past."<sup>1</sup> That this condition still exists today in even greater measure is a sad commentary

upon the progress of public land acquisition technique since the turn of the century.

Field investigation of the legal machinery and administrative practices in acquiring land for State highways and parkways reveals striking inefficiency and obsolescence. With the establishment of the State highway department, New York, like many other States, fell heir to ancient land acquisition procedures; and with few exceptions, little revision or simplification has been attempted. Possibly the greatest single impediment in the provision of a modernized highway system is the inability of the State to acquire efficiently the lands necessary for highway purposes.<sup>2</sup>

For some time, there has been agitation to reform the mechanism by which New York and its political subdivisions forcibly acquire lands for highway facilities. Inherent obstacles threaten the transport structure built up and maintained in recent years and impede its

As this article went to press, two bills pending in the New York Legislature, were enacted into law and became Chapters 194 and 544, Laws of New York, 1944.

Under this new legislation, the State Superintendent of Public Works is empowered to finance and acquire lands for rights-of-way on the State system. The method of land acquisition prescribed is the administrative Court of Claims system, substantially the same as that now being employed in the grade-crossing-elimination program, recommended in this article.

This is a forward step in land acquisition practice. Other States may well follow the New York example.

<sup>1</sup> From the Governor's message, New York, 1907.

<sup>2</sup> For a discussion of the right-of-way acquisition problem in the United States as a whole, see a pamphlet issued by the Public Roads Administration entitled "Public Land Acquisition for Highway Purposes," by David R. Levin, June 1943.

modernization. This investigation was undertaken to compare and appraise the various practices in New York in the acquisition of land for State highways, for highway-railroad grade-crossing eliminations, and for parkways.<sup>3</sup> It is the purpose of this commentary to outline the criteria of an effective public land acquisition policy and to indicate the extent to which New York practices meet desirable standards.

#### A SINGLE EFFICIENT LAND ACQUISITION METHOD IS NEEDED

A principal weakness of right-of-way acquisition practice in New York is the variety of methods, voluntary and compulsory, of acquiring lands. Of the many laws which provide for the acquisition of private property for public purposes in the State, but four have been surveyed in this investigation, namely, the Highway Law, the State-wide Grade Crossing Elimination Act, the Syracuse Grade Crossing Elimination Act, and the Conservation Law.<sup>4</sup> Despite the substantial identity of their purposes, each of these laws designates a different method for the acquisition of lands, three of them cumbersome, costly, and time-consuming.

The land acquisition machinery designated in these laws may be roughly classified as either judicial, exemplified by the Highway Law, or administrative, as illustrated by the Grade Crossing Elimination Act. The administrative system is a modern development.

Under the judicial method of public land acquisition, after necessary preliminary steps have been taken, the condemner seeks to purchase the property through negotiation; if the power of eminent domain must be resorted to, the condemner invokes the formal legal machinery by service of a petition upon the condemnee-owner, the court after hearing the evidence determines, with or without a jury, the just compensation for the property, and title passes after the award has been paid the owner. Under the administrative type, after certain preliminaries, the condemner files a plat and description of the property, and after notice to the owner of such action, the appropriation is complete and title to the property vests in the State. If formal offers of the condemner are rejected, the owner must file a claim for the value of his property taken or damaged with the State Court of Claims which makes an award after hearing all the evidence.

While the theoretical legal foundations of public authority for each of the laws investigated can be distinguished, practically, the common objective is the acquisition of private property for a public use or purpose. In the forcible acquisition of rights-of-way for highways, the power of eminent domain is exercised for a public purpose; lands for grade-crossing eliminations are taken under the State police power to protect the public health, safety, and morals; while rights-of-way for parkways are acquired under the power of eminent domain for the preservation of natural resources. In all cases, it is recognized that just compensation for the taking of private property must be made, and that in so doing, due process of law must prevail. A single uniform method, preferably of the administrative type, for the acquisition of all lands for

public purposes in New York can be effectively substituted for many present cumbersome procedures.

Entrance to private property to study road location and make surveys is a necessary activity precedent to the construction of roads. It may be that the right of entrance for surveys is implied if not expressly granted by statute, but it is highly desirable that it be specifically indicated in the law.

None of the land acquisition methods surveyed in New York makes specific provision for entry for surveys. New York may well follow the lead of the few States that have granted the right by law, specifying that the entry and survey must be made in a manner compatible with the greatest public benefit and the least private injury, and that highway authorities will become liable for injuries resulting from negligence or malice.

#### RIGHT OF IMMEDIATE POSSESSION OF LANDS MOST IMPORTANT

The delay and expense experienced in many land acquisitions may be attributed, in large part, to the absence or inadequacy of a legal right to enter and take possession of the desired premises after certain preliminary negotiations have been completed.

While a right of entry and possession is granted under the various laws surveyed in this investigation, it is granted in a different manner and at varying times under each method of land acquisition. Under the Highway Law, a right of entry exists, presumably, as soon as an agreement is executed; in the event condemnation is necessary, the filing of the oaths of commissioners of appraisal vests the title to the lands in the county whereupon a right of entry exists. This is likewise true of acquisitions under the Syracuse Grade Crossing Elimination Act and for the Bronx Parkway Extension. Under the court or referee system, utilized only in Erie County, county agents may enter upon the lands after a copy of the condemnation petition and a map of the parcel have been filed with the county clerk and notice has been given to the owner. The State-wide Grade Crossing Elimination Act, as well as the Conservation Law under which the Eastern State Parkway was established, provide that notice to the owner of the appropriation by the State completes the title, whereupon the State may enter upon the property.

The right of entry and possession thus variously granted is substantially sufficient to expedite the construction of highway facilities, but a uniform method granting the right upon notice to the owner, of the appropriation as under the Grade Crossing Elimination and Conservation Laws, is highly desirable.

#### CENTRALIZED STATE LAND ACQUISITION ORGANIZATION AN IMMEDIATE SOLUTION

The establishment of an efficient, centralized land acquisition department as an adjunct to the State highway department may well provide the basis for an immediate solution of the right-of-way problem in New York. This is particularly true with reference to the acquisition of lands for State highways, where the local units of government continue to acquire rights-of-way for a highway system which has rendered their land acquisition activities obsolete.

Survey of the present organizations which acquire lands for highways, parkways, and grade-crossing

<sup>3</sup> The study was undertaken in 1940 by the Public Roads Administration under a cooperative agreement with the University of Wisconsin. It was directed by Dr. Henry R. Trumbower, Senior Agricultural Transportation Economist, Public Roads Administration, and Professor of Transportation, University of Wisconsin. H. R. Briggs, A. R. McGinley, and the author supervised the project.

<sup>4</sup> See p. 313 for a complete analysis of these laws.

eliminations brings to light a motley array of agencies. The county boards of supervisors, operating through special right-of-way committees, are authorized to acquire lands necessary for State highways; of 26 counties investigated, only two maintain separate, full-time right-of-way organizations, namely, Westchester and Erie Counties.<sup>5</sup> In contrast, all lands required for grade-crossing eliminations (except in New York City, Buffalo, and Syracuse) are acquired by a central State agency, the Grade Crossing Bureau of the Department of Public Works. This bureau has an adequate staff of trained experts, maintains complete records of its transactions, and follows practices that have made it one of the most efficient land acquisition bodies in the State. Midway between the extremes of county acquisition for State highways and State acquisition for grade-crossing eliminations, is the authority to acquire lands for grade-crossing eliminations in the city of Syracuse.

Authority to establish the Eastern State Parkway is lodged with the five-member Taconic State Park Commission which acquires the necessary lands under a summary administrative method prescribed in the Conservation Law. While the acquisition machinery itself seems adequate, its operation in connection with the Eastern State Parkway has not been effective. Finally, the eight-member Westchester County Park Commission, as agent for the State, acquired the rights-of-way necessary for the Bronx Parkway Extension. While the procedure followed is substantially similar to that used for highway rights-of-way, efficient administration has tended to mitigate the destructive influences of an anachronistic land acquisition mechanism.

These are examples of the land acquisition agencies in the State. The need for extensive revision of the present system, particularly that for State highways, is apparent from an examination of the characteristics of an efficient centralized land acquisition organization and from comparisons with existing practices.

*Skilled personnel.*—Specially trained and expert personnel are required to cope with the complex right-of-way requirements of modern public highways. Engineers, lawyers, negotiators, appraisers, photographers, and other experts have convincingly demonstrated their efficiency by ultimate savings in total acquisition costs.

A primary weakness found in right-of-way acquisition in New York was the absence of full-time permanent agents qualified in the tasks they were to perform. Isolated exceptions were found. Erie and Westchester were the only counties with fairly adequate personnel for land acquisition. On the other hand, early and consistent provision has been made for trained personnel with specialized skills, employed on a full-time basis, in land acquisition for the State-wide grade-crossing-elimination program. In contrast with elected and appointed county personnel, every individual associated with grade-crossing land assembly is a civil service selectee. It is doubtful whether the volume

of work which the Syracuse Grade Crossing Commission undertakes is sufficient to justify a more specialized organization than exists at present. Results of a survey of both the Taconic State Park Commission and the Westchester County Park Commission as agents for the State points to the urgent need for an over-all State organization, similar to the Grade Crossing Bureau, to facilitate the acquisition of lands for State highways, grade-crossing eliminations, parkways, or other road facilities.

*Adequate records.*—Public land acquisition is a business enterprise and adequate records of all transactions should be maintained. Every legal document, letter, record, and written statement concerning a given highway development should be retained in a central office, classified according to route number and subclassified by consecutive parcels or alphabetically by the name of the grantor. These records would include title searches, reports on title examinations, appraisals, special reports, and all correspondence. Cost ledgers should be maintained indicating for every parcel, *inter alia*, the following items: Land costs per acre and for the parcel; damages, segregated as to improvement and consequential damages and the nature of each of these; consequential benefits, if any; incidental costs, such as title search fees, appraisal fees, and condemnation costs in detail.<sup>6</sup>

Of the five agencies surveyed, the records of the State Grade Crossing Bureau were by far the best. County records concerning land acquisition activities are generally absent altogether and such as do exist are amazingly scanty and inadequate; the methods used are highly diverse because of the many different units involved. Of the 26 counties investigated, the best records were found in Erie, Westchester, Columbia, and Schenectady Counties, but even in these places there is much that can be improved. The records concerning the Eastern State Parkway, the Bronx Parkway Extension, and Syracuse grade-crossing eliminations may be characterized as mediocre.

A good illustration of the type of record keeping desirable in right-of-way acquisition may be found in the Grade Crossing Bureau. While the system used is not perfect in every respect, it does include the more important features. The centralized records consist of a series of folders containing all information pertaining to each project, and to each parcel within such project, filed under a special Public Service Commission number. Each folder contains a map of the entire project, plat maps for each parcel, engineers' estimates of land and damage costs, reports of physical inspection of the property, copies of formal notices, photographs of the properties, copies of agreements, Court of Claim proceedings, as well as correspondence and memoranda concerning all transactions. Included also are memoranda indicating the basis of settlement, in terms of land costs, and the various elements of damages. Out-of-pocket expenditures for incidental services, such as witness fees, etc., were shown only to a limited extent.

If it should be deemed inexpedient for the State to assume control of land acquisition for State highways, then there is urgent and immediate need for those units doing the work to adopt an adequate system of

<sup>5</sup> This county procedure is prescribed by the Constitution of the State of New York in the following terms in art. I, sec. 7: "When private property shall be taken for any public use, the compensation to be made therefor, when such compensation is not made by the State, shall be ascertained by a jury, or by the Supreme Court with or without jury, but not with a referee, or, in proceedings affecting property located within the city of New York and to be acquired by the city of New York, by a term of said court to consist of one or more justices thereof without a jury, or by not less than three commissioners appointed by a court of record, as shall be prescribed by law." In view of the travail generally involved in securing constitutional amendments and the multiplicity of administrative units involved, the desirability of a centralized State public land acquisition organization is compelling indeed.

<sup>6</sup> The New York Supreme Court has ruled that when property is acquired for a public purpose, the following facts should be indicated: (1) The elements of cost divided among land, buildings, consequential damages, and consequential benefits; (2) the manner in which each of these items is affected; (3) the amount of damage or cost allowed on each item; and (4) the rule by which such values were determined. See *Matter of Board of Supervisors*, 140 Misc. (N. Y.), 894.

records. Standard forms should be evolved after some study and every county in the State should be required to use them with uniform interpretation and to maintain records in a single office at the county seat.

*Prenegotiation appraisals.*—A prenegotiation appraisal is a scientific determination of the value of a given parcel, in terms of land, improvements, and consequential damages. Its purpose is to provide the basis for an intelligent and fair settlement with the owner. A condemnation appraisal is such a determination after negotiations have broken down and court proceedings are under way. Its purpose is to justify the State's or the county's assertion of value of the parcel.

Examination of the present appraisal practices in New York brings much to light that can be improved. Only three of the many counties studied make prenegotiation appraisals, namely, Westchester, Erie, and Schenectady. The efficiency of this system in Erie County is reflected in the close approximation of the final settlement to the appraised values, the variation being less than ten percent. In the remaining counties, only a condemnation appraisal is made, and only when it is essential to the prosecution of eminent domain proceedings. Under the procedure generally used, the owner is likely to be well paid for his efforts in bargaining.

The approach in determining property values in a majority of counties is basically unsound. Widespread absence of the prenegotiation appraisal, explains why some property owners are recalcitrant and compel the county to condemn their properties. Force of logic indicates that court proceedings, necessitating a condemnation appraisal, may be the only basis upon which an intelligent and fair award can be made. It is not at all unlikely that the number of condemnation suits could be materially reduced through the more extensive as well as intensive utilization of the prenegotiation appraisal. No brief is held for either condemner or condemnee and it is true, no doubt, that some property owners demand exorbitant prices. But it seems that county authorities are "putting the cart before the horse" when they attempt to purchase property without first making an impartial and scientific appraisal, waiting until they get into court to ascertain what they ought to pay the owner for his property.

Appraisals are particularly important in grade-crossing-elimination negotiations. The nature of the structures required results in high consequential damages due to severance and changes in grade. The Grade Crossing Bureau staff includes full-time, expert appraisers and claims adjusters who furnish detailed appraisals of every tract of land to be acquired for elimination purposes. The wisdom and economy of this practice is reflected in the close agreement of settlements with the appraised values and the relatively few contested cases.

The appraisal techniques of the Taconic State Park Commission and the Westchester County Park Commission are mediocre, although prenegotiation appraisals are made to a considerable extent. Settlements of the Syracuse Grade Crossing Commission are subject to the approval of the corporation counsel and the comptroller.

*Base or standard values.*—The use of base or standard values in the appraisal process promotes a fair and consistent determination of land and property awards. Base values are purchase prices set by public authorities

for all bare or "raw" land and for certain improvements and betterments such as fencing and trees susceptible of unit-of-value measurement. Except in special cases, authorities will deviate but little from these values in bargaining with owners of property. To illustrate, the right-of-way department may determine that agricultural pasture lands in Albany County are worth \$75 an acre and that ordinary fencing is worth \$1 a rod and bargain accordingly with property owners when land is desired for highway purposes.

The device has been used but sparingly in New York despite its potential usefulness, due in part to the multiplicity of local units which participate in public land acquisition, particularly for State highways, and in part to the anachronistic procedure under which such units function. The Taconic State Park Commission has used the device on the Eastern State Parkway with considerable success. Classification is based upon topography and land use, obtained through field inspection by the chief forester and the commission appraisers. Distinction is made between rolling meadow lands, rocky hillsides, orchard lands, swamps, and other types.

*Photographs.*—Photographs of parcels of property are often valuable in negotiations with the owner and in court proceedings, especially where the condemner takes immediate possession of the premises. What a person sees is many times more effective than what he hears.<sup>7</sup>

With the exception of the State Grade Crossing Bureau and Schenectady County, the land acquisition agencies investigated rarely use photographs. It is now standard practice with both organizations mentioned to take photographs of every parcel acquired, before, during, and after construction of improvements. The photographs are made part of the land acquisition records. Both organizations consider the device indispensable.

*Research.*—In recent years, highway authorities have recognized the need for evidence to substantiate allegations of inadequacy and obsolescence of existing facilities, of exorbitant land acquisition costs, and of legal and administrative incapacity to cope with the expanding requirements of modern motor transport. Research of this nature is entirely lacking in New York. A division of a centralized right-of-way department might well devote its energies to research along these legal and economic lines. It has been alleged that many condemnation cases have been "lost" because counsel lacked evidence to establish their contentions. There is urgent need for assemblage and interpretation of all the facts on right-of-way practices and procedure, in the same manner that the State-wide highway planning surveys, under guidance of the Public Roads Administration, have undertaken the task with respect to the highway system and its use.

#### TITLE SEARCHES AND EXAMINATIONS ARE EXPENSIVE AND TIME-CONSUMING

Because of the many owners of parcels of land and the frequent transfers of such ownership, the need for an adequate system of land registration is immediate and compelling. Examination of the systems of title searching and title examination in the transfer of property in New York indicates that the procedures are expensive and time-consuming.

<sup>7</sup> The National Association of Real Estate Boards has found that 87 percent of a sale was effected through the eye, 7 percent through the ear, and the remainder through the other senses.

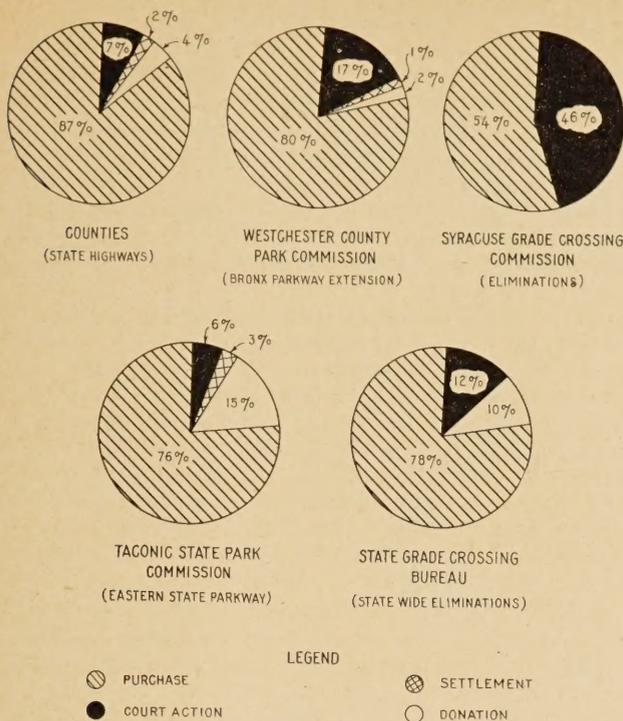


FIGURE 1.—PERCENTAGE DISTRIBUTION OF TOTAL AREA BY MANNER OF ACQUISITION FOR FIVE AGENCIES SURVEYED NEW YORK STATE, 1940.

Under the Torrens system of land registration, all deeds and documents affecting property are registered and a single certificate indicating who the owner is and what encumbrances exist on a given piece of property is readily available. This contributes to the easy marketability of title and greatly diminishes the delays and expense of title abstract extensions and title searches incident to ministerial or judicial transfers of land. The need for expensive and elaborate title searches in connection with the acquisition of lands for public improvements is obviated.

While New York has the necessary enabling legislation for land title registration, the device is utilized only rarely. A recent study has disclosed that approximately only one-tenth of one percent of real estate title proof took place under the land title registration system.<sup>8</sup> Instead, a title search is made at great expense and with unreasonable delay. In the acquisition of lands for State highways, title search costs ranged from \$3 to \$40 per parcel, exclusive of examination expenses, in the counties surveyed. Even under the otherwise efficient grade-crossing-elimination program, such costs ranged from \$9 to \$293 per parcel, the average being approximately \$45. The spread for Syracuse grade-crossing eliminations was from \$7.50 to \$90, with the average between \$40 to \$50 per parcel. Title search fees for parkway land acquisitions were high, ranging from \$5 to \$410 per parcel for the Eastern State Parkway, and from \$10 to \$500 for the Bronx Parkway Extension. In the aggregate, title search costs constituted the largest single item of incidental expense. The magnitude of these expenditures warrants a careful consideration of the merits of the Torrens system of land registration.

<sup>8</sup> See "Systems of Land Title Examination: An Appraisal" by H. Russell and D. A. Bridewell, *The Journal of Land and Public Utility Economics*, May 1938, p. 134, et seq.

LANDS ARE ACQUIRED BY DONATION, PURCHASE, AND CONDEMNATION

Lands for highways, parkways, and grade-crossing eliminations in New York have been acquired variously through donation, purchase, settlement,<sup>9</sup> and condemnation. Figure 1 indicates the relative percentages of the total area by manner of acquisition for State highways, State-wide and Syracuse grade-crossing eliminations, the Eastern State Parkway, and the Bronx Parkway Extension.

Approximately 7 percent of the land acquired for State highways was condemned, while almost half of the area required for Syracuse grade-crossing eliminations was obtained through court action. Approximately 12 percent of lands required for State-wide grade-crossing eliminations was obtained through proceedings in the Court of Claims. While these data would seem, to place State highway acquisition in the most favorable light, these bare statistical facts are meaningless unless interpreted in light of general acquisition practices, such as the appraisal, negotiation, and condemnation policy. The efficiency of the acquisition machinery must be determined in the light of over-all cost and speed of acquisition.

COURT PROCEEDINGS ARE CUMBERSOME AND INEFFICIENT

Lands for highway facilities that cannot be obtained through negotiation and purchase must be acquired forcibly through court proceedings. Lands for State highways, Syracuse grade-crossing eliminations, and the Bronx Parkway Extension were acquired by the judicial condemnation process, while lands for State-wide grade-crossing eliminations and the Eastern State Parkway were taken forcibly by administrative appropriation and settlement in the Court of Claims.<sup>10</sup> The acquisition process as a whole is cumbersome, costly, and inefficient, particularly the judicial condemnation mechanism.

To illustrate, the Westchester Park Commission desired about five acres of Mrs. X's farm for the Bronx Parkway Extension. Three appraisers valued the property at \$1,742, \$1,314, and \$2,080, respectively, all of which were in excess of the current market values of similar property. The commission offered Mrs. X \$2,570 for the 5.1 acres of ordinary unimproved farm land. Little damage would be done the remaining land by parkway improvement. Two years later, the attorneys for Mrs. X protested to the Governor concerning the unnecessary delay and expense, indicating that the condemnation commission had held 40 meetings and had only met and adjourned at half of the meetings. Each of the members received \$25 per day for each of these sessions. Finally, after almost four years of negotiation and litigation, Mrs. X received an award of \$8,368, and the total additional out-of-pocket expense of the condemnation proceedings to the State was \$8,964.

A drastic revision of procedure seems indicated, and probably should be modeled after the administrative Court of Claims procedure. Redesign of the court acquisition machinery should take into consideration the following elements.

<sup>9</sup> Lands are acquired by settlement when condemnation proceedings are initiated for a given parcel, but the owner comes to terms and settles "out of court."

<sup>10</sup> For the distinction between the judicial and administrative processes, see discussion, p. 302.

*Court tribunals.*—The number and types of tribunals designated to hear condemnation suits are many and diverse. The five different land acquisition laws surveyed designate five different court tribunals to try cases of forcible acquisition. The highway law lodges authority in the county court, the supreme court, and the three-member commission of appraisal in all counties except Erie County, which may utilize a Supreme Court Justice or an official referee, at its option. All court proceedings arising under the Grade Crossing Elimination Act are tried in the State Court of Claims, while the Syracuse Grade Crossing Elimination Act designates the county court and the commission of appraisal, as does the Eastern State Parkway legislation. Claims arising out of land acquisition for the Bronx Parkway Extension were tried in the Court of Claims. Neither the character of the condemner nor the purpose for which property is taken justifies such diversity.

There is a very positive correlation between the purchase and court acquisition policies followed by a given agency. The Grade Crossing Bureau has established an enviable record in its purchase policy, in the 16 years of its existence. Examination of a reliable sample of 3,000 parcels acquired for grade-crossing eliminations in all portions of the State indicates that only one-half of one percent was acquired through court proceedings.

A number of explanations may account for the ability of the bureau to acquire practically all of the necessary lands through voluntary negotiation. Purchases are based upon policies which other land acquisition organizations in the State may well adopt. A bona fide attempt is made by the State to settle each case on the basis of fair values ascertained in a scientific manner. While negotiating practices are flexible, the policy of rather rigid adherence to appraised values prevails. Such a practice, consistently followed, soon becomes well known among the property owners affected by grade-crossing eliminations as well as the bar, with the concomitant realization that nothing can be gained by rejecting reasonable offers.

This is in contrast with the current policy of many counties in acquiring lands for State highways. In dealing with counties, property owners are likely to be well paid for their efforts in bargaining or in condemnation proceedings. The Grade Crossing Bureau is not thwarted by dilatory practice. It has the power, after summary preliminaries, of immediate entry and possession upon the lands of recalcitrant owners. The burden of invoking legal remedies for the recovery of compensation in excess of the State's concept of fair value devolves upon the property owner rather than upon the condemner as in county acquisition of State highway rights-of-way.

Perhaps one of the best explanations of the relatively successful purchase and court policy of the grade-crossing organization is found in the nature of the Court of Claims. Under the law, property owners who file claims for damages with that tribunal do so at their own risk and expense; irrespective of the outcome of the case, they are not reimbursed for their court costs, disbursements, and attorney and witness fees. There is little incentive, therefore, for owners to resort to court proceedings.

*Preference of land acquisition cases on the court calendar.*—Because public highway improvements are many and sorely needed and because court dockets are congested, condemnation suits ought to be preferred on the court calendar.

Except in isolated cases, little provision is made in the State for preferences in court cases. While Erie County cases and suits arising out of the Eastern State Parkway improvement enjoyed a theoretical preference in court, little effort was exerted to make such a preference effective. It is suggested that the present land acquisition laws be revised, to the end that all forcible acquisition proceedings be given preference over all other civil actions in setting times for hearing and trial. Means should be devised to make such a preference effective in practice.

*Group court proceedings.*—Group condemnation—the prosecution of eminent domain proceedings against a number of separate parcels or owners in a single suit—ought to be sanctioned by law and used effectively in the acquisition of lands for highway facilities. The device is used in New York only to a limited extent. Warren, Westchester, and Schenectady Counties use group condemnation effectively in the acquisition of lands for State highways, while the other land-acquiring agencies surveyed utilize the technique but sparingly. Its widespread adoption is recommended.

*Abandonment of condemnation proceedings.*—When the need arises, the condemner of lands should be permitted to abandon condemnation proceedings except where the property is deemed already to have been taken. It may develop that the particular property in question is no longer desired for the improvement, or the award may be excessive. The laws of New York make no provision for abandonment.

*Friendly, noncontested, summary court proceedings.*—Friendly, noncontested, summary court proceedings should be sanctioned in unusual cases and to cure defective titles to property acquired for public purposes. An illustration of the need for such a device was found in this survey. Warren County attempted to purchase from Syracuse University certain lands for a highway improvement, but difficulties arose because the land had been donated originally to the university for educational purposes and now was to be dedicated to highway uses. Condemnation proceedings had to be instituted to solve the problem.

#### COSTS OF COURT ACTION HIGH

It is most difficult to make fair comparisons of the efficiency of the forcible acquisition procedure of one system with that of another, or of one device with another on the basis of costs alone. Other factors are present, the effect of which cannot be separated statistically. For example, there may be fewer court cases under one procedure than under another; yet it cannot be said, per se, that the method generating the fewer contested cases is the more efficient. The competence of a system of land acquisition is a function not only of the number of parcels condemned, but also of the nature of the individual acquisitions, the final offers and awards for all purchased parcels as compared with the true market values, the normal purchase policy, the length of negotiation, land uses, population density, and a host of other influences. Any analysis of court cases which takes these variables into account will indicate that the resultant sample is much too small to be reliable.

Any detailed analysis of cost statistics is to be treated with caution but a few general conclusions are apparent from this survey. While the expense of court action in the acquisition of lands for highway facilities is uni-

TABLE 1.—Summary of cost elements for parcels acquired by court action under various methods of compulsory acquisition

Item	Number of parcels	Area in square yards	Total cost		Property cost		Total cost of court action			Incidental cost	
			Amount	Percent	Amount	Percent	Amount	Cost per parcel	Percent	Amount	Percent
<b>Condemnation:</b>											
State highways.....	70	471,204	\$172,810	100	\$119,608	70	\$52,624	\$752	30	1,578	3
Syracuse grade-crossing elimination.....	23	4,371	86,257	100	60,448	70	23,457	1,020	27	2,352	1
Bronx Parkway Extension.....	6	336,350	138,098	100	84,421	61	52,434	8,739	38	1,243	1
<b>Court of Claims appropriation:</b>											
State-wide grade-crossing elimination..	19	87,105	44,253	100	37,936	86	5,815	306	13	502	1
Eastern State Parkway.....	8	1,193,108	95,814	100	79,325	83	15,741	1,968	16	748	1

<sup>1</sup> This includes \$488 incidental cost and \$90 taxes.

TABLE 2.—Comparison of cost elements of court proceedings under various methods of compulsory acquisition

Item	Number of parcels	Total condemnation costs		Commissioners' fees		Attorney's costs		Interest		Other court costs <sup>1</sup>	
		Total	Cost per parcel	Total	Cost per parcel	Total	Cost per parcel	Total	Cost per parcel	Total	Cost per parcel
Total.....	126	\$150,071	\$1,191	\$47,573	\$378	\$15,111	\$120	\$42,088	\$334	\$45,299	\$359
<b>Condemnation:</b>											
State highways.....	70	52,624	752	22,012	314	5,735	82	7,168	102	17,709	253
Syracuse grade crossings.....	23	23,457	1,020	12,261	533	4,760	207	1,566	68	4,870	212
Bronx Parkway Extension.....	6	52,434	8,739	13,300	2,217	4,616	769	17,186	2,864	17,332	2,889
<b>Court of Claims appropriation:</b>											
State-wide grade crossings.....	19	5,815	306	-----	-----	-----	-----	3,927	207	1,888	99
Eastern State Parkway.....	8	15,741	1,968	-----	-----	-----	-----	12,241	1,530	3,500	438

<sup>1</sup> These costs include appraiser's fees, witness fees, stenographer's fees, and other miscellaneous court costs.

formly high, table 1 indicates that such expense constitutes a much greater portion of aggregate costs in the judicial condemnation of lands for State highways, for Syracuse grade-crossing eliminations, and for the Bronx Parkway Extension than in the administrative court acquisition of lands for State-wide grade-crossing eliminations and for the Eastern State Parkway.

The percentage in judicial condemnation is approximately twice that in administrative court acquisition. The total cost of court action averaged only \$306 per parcel for State-wide grade-crossing eliminations, while such costs averaged \$8,739 per parcel for the Bronx Parkway Extension, an alarming expense. In many cases, the court expense exceeds the property award itself; and the greater the award, the more serious this situation becomes.

It is not surprising that the counties and acquisition organizations are often "intimidated" into making unreasonable purchase settlements rather than resorting to court proceedings. A typical illustration of inflated property values was found in the records of the Bronx Parkway Extension. The Westchester County Park Commission had appraised a small property at \$972 and had offered its owner \$1,600, but \$6,750 was demanded. Rather than proceed with condemnation, the owner was allowed \$6,000.

Court expenses are made up of commissioners' fees, witness and appraiser fees, court costs and disbursements, attorney's fees reimbursed the property owner, interest charges, and miscellaneous items. A comparative analysis of these costs appears in table 2. Compensation costs of commissioners of appraisal in judicial condemnation proceedings have been a weakness of long standing in the land acquisition machinery for State highways, Syracuse grade-crossing eliminations, and the Bronx Parkway Extension. They constituted the largest single item of court expense, ranging from \$314 per parcel for State highways, to \$2,217 per parcel for the Bronx Parkway Extension. Full-day sessions are not required of commissioners of appraisal and they

have every inducement to prolong a contest as long as possible.

For example, the record of a typical State highway condemnation case reveals that out of 16 sessions of the commission, six lasted half an hour, eight a half day, and only two all day. For one simple condemnation case on the Bronx Parkway Extension, the commission held 56 hearings at a cost of \$4,200 in commissioners' fees. In another instance on the same improvement, 40 sessions were held, half of which consisted of meeting and adjourning. Many other illustrations could be given.

Other items of considerable magnitude are court costs and disbursements and attorney fees reimbursed the property owner if he is the prevailing party in the condemnation proceedings, i. e., if the court award is in excess of the final offer by the county. Such costs are paid by the condemner to the extent of \$65 plus an additional 5 percent of the award. These costs per parcel aggregated \$82 for State highway condemnations, \$207 for Syracuse grade-crossing eliminations, and \$769 for the Bronx Parkway Extension.

In contrast with the judicial condemnation procedure commissioners' and attorney's fees are not permitted under the administrative appropriation system of State-wide grade-crossing eliminations and the Eastern State Parkway. While it is true that these out-of-pocket expenditures are offset in part at least, by that portion of the salaries of the Court of Claims personnel attributable to claim cases, these costs are not large; the characteristic efficiency of that body prevails in land acquisition litigation as in other contests.

Aside from the immeasurable losses from delay in use of needed improvements, unwarranted delays inherent in some of the land acquisition systems result in tangible costs in the form of interest charges. These costs ranged from \$68 per parcel for Syracuse grade-crossing eliminations to \$2,864 per parcel for the Bronx Parkway Extension. The magnitude of this item alone is sufficient to indict some of the present systems of land acquisition.

Miscellaneous court costs, including appraiser and witness fees, stenographic costs, publication expenses, service of process fees, and related items, ranged from \$99 per parcel for State-wide grade-crossing eliminations to \$2,889 per parcel for the Bronx Parkway Extension. Aside from these substantial expenditures, the services of many salaried State and county employees are required in contested court cases, such as State attorneys, county attorneys, highway department officials, and their assistants.<sup>11</sup> The general departmental overhead expenses should not be overlooked. Out-of-pocket condemnation costs may range from \$500 to \$1,500.<sup>12</sup> The prospect of bearing these costs as well as the probability of an unfavorable award has prompted many acquisition organizations in the State to shun forcible court action.

#### MANY COURT AWARDS CONSIDERED EXCESSIVE

Study of court cases showed that most court awards are excessive. Facts were available concerning condemnation awards for 23 State highway parcels. Total awards were more than double the total of appraised values. Court awards for six parcels condemned for the Bronx Parkway Extension were more than two and one-half times the total appraised values. Final awards for 19 parcels for Syracuse grade-crossing eliminations exceed the appraised values by 45.6 percent. This is the lowest figure of any land acquisition organization surveyed.<sup>13</sup> But consideration of the fact that approximately half of all acquisitions are condemned causes the apparent superiority to vanish.

Even final awards given in the State Court of Claims are substantially in excess of the appraised values. Such awards for 12 parcels for State-wide grade-crossing eliminations exceeded the appraised values by 83.6 percent, while total awards for 8 Eastern State Parkway parcels contested in the Court of Claims were substantially more than double the total of appraised values.

Bare statistical facts, however, should not serve as the sole criteria in determining whether a system of acquisition is efficient or awards excessive. Other factors, such as the tendency toward price inflation in acquirement by voluntary purchase, the appraisal policy, the relative frequency of forcible acquisition, as well as other influences serve to condition the over-all effectiveness of a land acquisition technique. It is significant that 91 parcels were purchased for the Eastern State Parkway at an average cost of only \$35 per acre, the damage item being almost negligible. There was little tendency toward price inflation in these purchases. In acquiring State highway parcels in Columbia County, land costs and improvement damages were appraised at substantially the amounts finally awarded, but appraised consequential damages were far less than final awards by the condemnation commission. This was due to a deliberate policy of Columbia County to appraise consequential damage items at a low figure.

In view of the nature of condemnation proceedings and the evidence presented at hearings, condemnation

commissions, courts, and juries are sometimes helpless to prevent excessive awards being granted. Too often, when confronted with highly divergent "expert" appraisals by the county and the property owners, commissioners, courts, and jury panels will strike an average between extremes and make an award on that basis.<sup>14</sup> There is something organically wrong with a system that generates such inequitable results.

#### METHODS OF REDUCING CONDEMNATION COSTS NOT A DIFFICULT PROBLEM

Assuming that it is desirable to retain the framework of the existing land acquisition systems in New York, there are certain devices that may be utilized to reduce condemnation costs. These include the referee system, group condemnation, and prenegotiation appraisals.

*Referee system.*—Erie County avoids some of the condemnation costs common to other counties in the acquisition of rights-of-way for State highways by utilizing a referee<sup>15</sup> as a special agent of the court instead of the commissioner of appraisal system. While this device is no guarantee against excessive awards, it avoids commissioners' fees which would considerably exceed that portion of the referee's salary chargeable to condemnation cases. Special stenographic fees are avoided by the substitution of a regular court reporter. Since eminent domain proceedings are given preference on the referee's calendar and effort is made to expedite adjudication, interest payments are at a minimum.

*Group condemnation.*—Group condemnation, as practiced in Warren and other counties, is the prosecution of eminent domain proceedings in a single, consolidated court action, without jeopardizing private property rights. Costs of separate condemnation commissions, repetitive testimony of experts, and other costs are avoided. Full-day sessions are required of commissioners and experts and it has been demonstrated that several cases can be disposed of in a few days. In most counties a separate condemnation commission is appointed for each proceeding with attendant expenses for commissioners and witnesses. There is considerable duplication of evidence in acquiring parcels. Since the parcels on a given highway development are generally in the same locales, many of the evidences of value apply to all in common. Group proceedings are likely to be completed much sooner than a number of separate actions.

*Prenegotiation appraisals.*—The number of condemnation suits may be materially reduced through prenegotiation appraisals. An efficient acquisition system must be predicated upon an impartial and scientific analysis of fair market values. It is a sad commentary upon present New York practice that the majority of counties wait until they get into the courts to ascertain what they ought to pay an owner for his property.

#### SPECIAL BENEFITS SHOULD BE RECOGNIZED

Special benefits accruing to property as a result of the improvement for which a portion of the property is taken ought to be offset against damages to the remainder. In New York, such benefits are permitted to

<sup>11</sup> No attempt has been made in this investigation to allocate fixed salaries or office overhead to systems of land acquisition or parcels of land acquired.

<sup>12</sup> The average out-of-pocket court expense for the 126 parcels acquired under all systems surveyed averaged \$1,191 per parcel. See table 2.

<sup>13</sup> Assuming the sample is reliable.

<sup>14</sup> In making its award, the condemnation commission is not restricted to any species of evidence, but may act upon its own judgment and upon any information which is acquired from inspection of the property, as well as on evidence produced at the hearing. Evidence of experts is not binding, but is advisory only. See *City of Rochester v. Casey, Eagan, Falk, et al.*, 234 App. Div. 583 (1932).

<sup>15</sup> Formerly a justice of the supreme court.

be offset only against consequential damages to the remaining portions of the land. The value of benefits cannot be deducted from the value of property taken for the improvement. It was rare that benefits of any kind were taken into account in determination of compensation for acquisitions surveyed in this investigation. While it is true that benefits are sometimes speculative in nature and difficult of precise measurement, it is good public policy to permit their deduction, for it is not just to permit a property owner adjacent to an improvement to reap special benefits from the expenditure of public funds which others cannot share. The owner should be placed in the same position after the forcible acquisition that he enjoyed before his property was taken; in other words, he must be made "whole" as the courts have commanded, but that is all. His position need not be improved, although too often it is.

#### FINANCING ACCOMPLISHED BY VARIOUS MEANS

Rights-of-way for State highways must be acquired by counties at their own expense, as directed by State statutes. This survey indicates that some counties have balked at financing land acquisition for improvements designed largely for through traffic, and of little local concern. The obvious financial incapacity of local units is becoming more and more an obstacle to the provision of adequate highway facilities.

All costs of acquiring lands for the Eastern State Parkway as well as the Bronx Parkway Extension are financed by the State through the Taconic State Park Commission and the Westchester County Park Commission, respectively. Grade-crossing eliminations are financed by Federal, State, local, and railroad contributions, in varying proportions.<sup>16</sup>

#### PUBLIC REPLACEMENT POLICY DESIRABLE

The device of public replacements, despite its potential usefulness in reducing damage costs, is utilized but sparingly in New York. Cattle passes can be built to eliminate damages for severance or change of grade, fences can be replaced by highway department forces to avoid damage payments, and driveways can often be graded as part of the construction contract. If the work is of such a nature that the highway department forces cannot do it economically, contracts can be let after competitive bidding, with resulting savings in costs. Dutchess and Westchester are practically the only counties employing this device, even to a limited extent. Officials in one county alleged that a public replacement policy has not been followed because the county is not authorized by law to use county labor to make highway improvement more efficient.

A vigorous policy of public replacement, particularly of fencing and driveways, has greatly reduced damage payments on the Eastern State Parkway. Refencing was facilitated by a combination of CCC labor and use of lumber from trees felled in making the improvement. Driveways and other improvements damaged were repaired by the parkway construction contractors in the regular course of their activities.

#### ANALYSIS OF RIGHT-OF-WAY COSTS IMPORTANT

Many factors influence land acquisition costs. The nature of the property acquired and its present and potential uses have a decided effect upon its value. The

extent of present highway development will serve to condition the attitude of property owners toward a proposed improvement. The character of the land acquisition organization and its policies have a remarkable influence upon the efficiency of the whole acquisition process, which ultimately is reflected in over-all acquisition costs. A vigorous policy with regard to public replacement of fences and small structures, prenegotiation appraisals, base values, trained personnel and condemnation is vastly superior to the hit-or-miss practices of an unorganized approach.

The relative bargaining abilities of the buyer and seller are not without their influence. This investigation indicates that most owners were well paid for bargaining efforts, particularly those from whom lands were taken for State highways, the Syracuse grade-crossing eliminations and the Bronx Parkway Extension. They obtained greater awards than might have been obtained in dealing with an organization better equipped.

Factors such as population density, the business cycle, real estate market values, special benefits to land as a result of the highway improvement, number and kind of structures and improvements, the extent of court action, and many related influences also determine the magnitude of over-all acquisition cost.

The complexity of these economic pressures is such as to make their respective influences statistically indeterminate. Available samples for analysis of the effect of any one influence are far too few for the purpose. Only a general analysis will be made.

Over-all acquisition costs seem to be a function of the purpose for which lands are acquired and of the acquisition organization. Rights-of-way for State highways are acquired at reasonable cost by some counties while other counties pay seemingly exorbitant prices. Acquisition costs for the Eastern State Parkway are relatively low, with the exception of parcels appropriated by court action. On the other hand, the Bronx Parkway Extension entailed comparatively high costs, due in part to proximity to metropolitan centers, and in part to the organically inefficient land acquisition machinery. State-wide grade-crossing elimination costs are high, because those eliminations most desirable are generally in or adjacent to highly developed areas, and because the very nature of grade-crossing eliminations, involving as they do changes in grade, generates severe consequential damages and often results in irregularly shaped remnants of land having little utility. This is likewise true of Syracuse grade-crossing eliminations, with the added corollary that property costs are generally somewhat greater because of urban influences and more intensive utilization.

*Property costs.*—Good indices of land values for comparison with highway right-of-way costs are lacking, but there is substantial evidence to indicate that prices paid are considerably in excess of market values. This may be accounted for by the fact that right-of-way costs are not free market values. The purchaser is known in advance and he cannot readily substitute one property for another. When a highway is projected, every parcel needed, with minor exceptions, must be acquired, and neither the purchaser nor seller is free in the sense of being a willing buyer and a willing seller. Highway authorities require designated lands and if government cannot purchase such lands through negotiation, it will resort to its power of eminent domain.

<sup>16</sup> See p. 313 for a complete discussion of the matter.

Assuming the property is taken for a public purpose, the owner must eventually part with the land, and if he will not negotiate for its sale, condemnation will force his hand. In other words, in public land assembly for highways, as for other public uses, peculiar conditions govern price, circumstances which do not normally prevail on the open market. These special conditions in the aggregate are reflected in what is sometimes labeled plottage or assemblage costs.

The announced policy of at least two counties in New York is to pay more than market values for property required for State highways. One county official indicated that his county ascertained the market value of the property and then offered the owner double that amount. Another county applied this same technique in acquiring smaller tracts of land, but offered 25 percent above the fair market value for properties worth over \$500. Yet these two counties were among those having the lowest land costs of those investigated.

Tables 3 and 4 indicate the components of property costs of parcels purchased by the five land acquisition agencies surveyed in New York. Damage payments are the largest element of cost in State highway and grade-crossing-elimination acquisitions while such payments are negligible in the acquisition for the two parkways. The significance of these facts is dealt with in the paragraphs which follow.

*Land and damage costs.*—The nature of the improvement for which land is acquired has served to condition the magnitude and kind of land and damage costs. State highway development, for the most part, con-

sisted of widening existing roads with relocations here and there. Widening necessitated the acquisition of long, rectangular strips of land adjacent to the existing highways rather than large contiguous tracts of land. Consequently, only about one-quarter of the total property costs is ascribed to land, while three-quarters constitutes damage payments. On the other hand, because they were so planned, both the Eastern State Parkway and sections of the Bronx Parkway Extension traverse largely undeveloped lands. On the Eastern State Parkway, for the 91 parcels purchased, land costs accounted for 92 percent of the aggregate costs, averaging approximately \$35 per acre; on the Bronx Parkway Extension, land costs for its 91 purchased parcels amounted to 82 percent of the total costs, averaging \$880 per acre. An analysis of the elements of damage payments is indicated in table 5.

*Incidental costs.*—These fees are those other than land, damage, and condemnation costs arising out of land acquisition activities; they include appraisers' fees, title search and examination fees, recording costs, and so on. This survey is limited in its treatment of incidental costs because only out-of-pocket expenditures were considered; no attempt was made to allocate the salaries of individuals concerned with land acquisition functions. Accordingly, incidental fees averaging approximately \$25 per parcel for State highway acquisitions, \$129 per parcel for the Bronx Parkway Extension, \$59 per parcel for the Eastern State Parkway, \$72 per parcel for Syracuse grade-crossing eliminations, and \$56 per parcel for State-wide grade-crossing eliminations, are of limited significance.

MARGINAL LAND ACQUISITION USED ONLY RARELY

Marginal land acquisition, or "excess condemnation" as it is popularly called, is the acquisition of land and property in addition to the immediate physical needs of a highway improvement but having definite economic and protective value in connection with such improvement. Despite the adequate enabling legislation<sup>17</sup>, the device has been used but rarely by the counties in the acquisition of lands for State highways, largely because its possibilities are still unknown and

<sup>17</sup> See page 314 for the legal provisions relating to marginal land acquisition.

TABLE 3.—Percentage relationship of elements of property cost of purchased parcels for five agencies surveyed

Kind of development	Property cost	Land cost	Damage cost
	Percent	Percent	Percent
State highways	100	24	76
Grade-crossing eliminations:			
State-wide	100	29	71
Syracuse	100	20	80
Parkways:			
Eastern State Parkway	100	92	8
Bronx Parkway Extension	100	82	18

TABLE 4.—Summary of number of parcels, area, and property costs for all purchased acquisitions under the agencies surveyed

Population group and land use	Highways			Parkways						Grade crossings						
	Number of parcels	Area	Property cost	Bronx Parkway Extension			Eastern State Parkway			Syracuse			State-wide			
				Number of parcels	Area	Property cost	Number of parcels	Area	Property cost	Number of parcels	Area	Property cost	Number of parcels	Area	Property cost	
		Square yards			Square yards			Square yards			Square yards			Square yards		
Grand total	1,746	5,693,714	\$1,306,892	91	1,584,033	\$349,294	91	16,133,591	\$126,472	25	5,176	\$92,275	365	556,962	\$509,443	
Rural	1,223	4,935,756	866,449	43	946,215	96,476	91	16,133,591	126,472				133	212,412	91,857	
Suburban	466	605,120	408,585	24	388,508	125,690							68	70,785	94,029	
Urban	57	152,838	31,858	24	249,310	127,128				25	5,176	92,275	164	273,765	323,557	
Agricultural	1,161	5,212,069	832,574	16	432,610	21,587	88	15,915,714	113,971				124	384,806	71,447	
Rural	914	4,663,407	653,239	16	432,610	21,587	88	15,915,714	113,971				91	191,710	43,690	
Suburban	223	414,283	167,643										7	1,331	166	
Urban	24	134,379	11,692										26	191,765	27,591	
Residential	442	244,095	312,614	64	980,302	283,724	2	100,851	6,701	25	5,176	92,275	148	104,942	253,883	
Rural	217	150,352	118,511	25	445,550	68,670	2	100,851	6,701				19	7,871	20,899	
Suburban	200	87,246	178,119	18	285,795	90,326							44	56,995	66,326	
Urban	25	6,497	15,984	21	248,957	124,728				25	5,176	92,275	85	40,076	166,668	
All other land uses	143	237,550	161,704	11	171,121	43,983	1	117,026	5,800				93	67,214	184,113	
Rural	92	121,997	94,699	2	68,055	6,219	1	117,026	5,800				23	12,831	27,268	
Suburban	43	103,591	62,823	6	102,713	35,364							17	12,459	27,537	
Urban	8	11,962	4,182	3	353	2,400							53	41,924	129,308	

<sup>1</sup> Includes commercial, industrial, semipublic, and public parcels.

untried. It is believed that the device can be utilized with particular effectiveness. Highway improvement often creates small remnants between the new and existing highways, of little use to their former owners. Columbia is practically the only county studied where extensive marginal lands were acquired and incorporated into the right-of-way. Extra costs were not incurred, since large payments for consequential damages would have been necessary had not the marginal lands been acquired.

The Grade Crossing Bureau does not acquire any more land than is required for the physical needs of an elimination. It seems that the marginal acquisition device could be utilized to good advantage in the grade-elimination program to avoid high consequential damages and the creation of remnants, for grade-crossing projects necessarily involve extreme changes of grade and severance injuries.

SCOPE OF THE INVESTIGATION BROAD

This investigation was undertaken to compare and appraise the various practices utilized in New York in the acquisition of lands for State highways, parkways,



FIGURE 2.—GEOGRAPHIC DISTRIBUTION OF PROJECTS INVOLVING STATE HIGHWAYS, GRADE-CROSSING ELIMINATIONS, AND PARKWAYS.

TABLE 5.—Summary of improvement and consequential damage costs for all purchased acquisitions under five agencies surveyed

Population group and land use	Highways						Parkways											
	Total damage cost		Improvement damages		Consequential damages		Bronx Parkway Extension					Eastern State Parkway						
	Amount	Per-cent	Amount	Per-cent	Amount	Per-cent	Total damage cost		Improvement damages		Consequential damages		Total damage cost		Improvement damages		Consequential damages	
							Amount	Per-cent	Amount	Per-cent	Amount	Per-cent	Amount	Per-cent	Amount	Per-cent	Amount	Per-cent
Grand Total	\$991,191	100	\$468,349	47	\$522,842	53	\$61,222	100	\$45,687	75	\$15,535	25	\$9,613	100	\$7,300	76	\$2,313	24
Rural	669,204	100	264,587	40	404,617	60	12,324	100	6,787	55	5,537	45	9,613	100	7,300	76	2,313	24
Suburban	301,235	100	198,192	66	103,043	34	27,296	100	19,200	70	8,096	30						
Urban	20,752	100	5,570	27	15,182	73	21,602	100	19,700	91	1,902	9						
Agricultural	639,881	100	280,816	44	359,065	56	600	100			600	100	4,813	100	2,500	52	2,313	48
Rural	497,017	100	195,600	39	301,417	61	600	100			600	100	4,813	100	2,500	52	2,313	48
Suburban	136,830	100	84,689	62	52,141	38												
Urban	6,034	100	527	9	5,507	91												
Residential	223,953	100	114,059	51	109,894	49	58,976	100	44,187	75	14,789	25	4,800	100	4,800	100		
Rural	92,878	100	31,363	34	61,515	66	11,724	100	6,787	58	4,937	42	4,800	100	4,800	100		
Suburban	118,556	100	77,732	66	40,824	34	27,150	100	19,200	71	7,950	29						
Urban	12,519	100	4,964	40	7,555	60	20,102	100	18,200	91	1,902	9						
Other land uses <sup>1</sup>	127,357	100	73,474	58	53,883	42	1,646	100	1,500	91	146	9						
Rural	79,309	100	37,624	47	41,685	53												
Suburban	45,849	100	35,771	78	10,078	22	146	100			146	100						
Urban	2,199	100	79	4	2,120	96	1,500	100	1,500	100								

Population group and land use	Grade Crossings											
	Syracuse						State-wide					
	Total damage cost		Improvement damages		Consequential damages		Total damage cost		Improvement damages		Consequential damages	
	Amount	Per-cent	Amount	Per-cent	Amount	Per-cent	Amount	Per-cent	Amount	Per-cent	Amount	Per-cent
Grand total	\$73,750	100	\$72,550	98	\$1,200	2	\$361,731	100	\$172,279	48	\$189,452	52
Rural							74,262	100	36,286	49	37,976	51
Suburban							61,336	100	20,640	34	40,696	66
Urban	73,750	100	72,550	98	1,200	2	226,133	100	115,353	51	110,780	49
Agricultural							59,080	100	20,286	34	38,794	66
Rural							36,381	100	12,660	35	23,721	65
Suburban							126	100			126	100
Urban							22,573	100	7,626	34	14,947	66
Residential	73,750	100	72,550	98	1,200	2	179,590	100	92,332	51	87,258	49
Rural							16,946	100	8,321	49	8,625	51
Suburban							40,386	100	8,429	21	31,957	79
Urban	73,750	100	72,550	98	1,200	2	122,258	100	75,582	62	46,676	38
Other land uses <sup>1</sup>							123,061	100	59,661	48	63,400	52
Rural							20,935	100	15,305	73	5,630	27
Suburban							20,824	100	12,211	59	8,613	41
Urban							81,302	100	32,145	40	49,157	60

<sup>1</sup> This includes commercial, industrial, semipublic, and public parcels.

TABLE 6.—Total number of parcels and area included in survey shown by population group and kind of development <sup>1</sup>

Item	Total		Rural		Suburban		Urban	
	Number of parcels	Area	Number of parcels	Area	Number of parcels	Area	Number of parcels	Area
State highways	2,072	<i>Square yards</i> 6,560,799	1,389	<i>Square yards</i> 5,410,770	608	<i>Square yards</i> 985,598	75	<i>Square yards</i> 164,431
Counties selected as representative <sup>2</sup>	1,308	3,864,978	769	3,119,074	506	738,786	33	7,118
Dutchess	175	1,309,005	160	1,290,682	15	18,323		
Erie	260	252,626	97	101,369	142	146,874	21	4,383
Niagara	43	104,528	38	102,553	5	1,975		
Rensselaer	153	233,088	84	148,077	69	85,011		
St. Lawrence	85	158,172	85	158,172				
Schenectady	172	258,845	17	20,860	155	237,985		
Warren	208	1,098,256	208	1,098,256				
Westchester	212	450,458	80	199,105	120	248,618	12	2,735
Counties selected on route basis <sup>3</sup>	764	2,695,821	620	2,291,696	102	246,812	42	157,313
Albany	73	123,757			73	123,757		
Clinton	46	363,145	46	363,145				
Columbia	70	644,093	70	644,093				
Livingston	45	188,927	40	185,492			5	3,435
Oneida	119	273,144	91	158,374	24	108,575	4	6,195
Saratoga	61	217,025	32	80,683			29	136,342
Schoharie	190	485,184	190	485,184				
Other counties <sup>4</sup>	160	400,546	151	374,725	5	14,480	4	11,341
Grade crossings	517	723,039	184	298,060	89	124,667	244	300,312
State-wide	469	713,492	184	298,060	89	124,667	196	290,765
Syracuse	48	9,547					48	9,547
Parkways	253	23,281,006	199	22,451,425	28	534,046	26	295,535
Taconic	153	21,289,927	153	21,289,927				
Westchester	100	1,991,079	46	1,161,498	28	534,046	26	295,535

<sup>1</sup> The majority of the data in this survey were abstracted between August and December 1940, with the exception of Syracuse grade-crossing data which were abstracted in February 1941.

<sup>2</sup> These counties primarily selected on basis of population density, highway mileage, and extent of development.

<sup>3</sup> To avoid bias in county selection, acquisitions on routes 5, 9, and 20 also were investigated. Only those counties having 45 acquisitions or more are listed separately.

<sup>4</sup> This includes the following counties on routes 5, 9, and 20 having less than 45 acquisitions—Cayuga, Essex, Genesee, Herkimer, Madison, Montgomery, Ontario, Otsego, and Seneca.

and grade-crossing eliminations, in terms of efficiency and adequacy. This necessitated the assembly of statistics and analysis of practices for five different land acquisition agencies, namely, the counties which acquired rights-of-way for State highways, the Taconic State Park Commission which secured lands for the Eastern State Parkway, the Westchester County Park Commission as agent for the State in the establishment of the Bronx Parkway Extension, the State Grade Crossing Bureau which purchased the lands necessary for State-wide grade-crossing eliminations, and the Syracuse Grade Crossing Commission which acquired lands for Syracuse grade-crossing eliminations.

The scope of survey varied with each of these organizations, as indicated in table 6 and figure 2. For the State highway analysis, eight representative counties were selected on the basis of highway development, land uses, topography, economic characteristics, and availability of the data. To augment this sample, acquisitions were studied on three through routes, i. e., State Route 5 and US 20, which traverse the State from east to west, and US 9 extending from north to south. A sufficiently large sample was obtained from acquisitions taking place between January 1936 and July 1940; but because there was marked activity on the three through routes between 1935 and 1940, an additional year was included for these data.

Analysis of State-wide grade-crossing eliminations included 31 representative projects involving 469 parcels acquired between 1928 and 1940, omitting all city projects. A sample of 48 acquisitions in Syracuse was later included. The investigation of parkway data included all the acquisitions for the Eastern State Parkway and all lands constituting the northern portion of the Bronx Parkway Extension. These two parkways are major State projects that traverse areas somewhat comparable to those traversed by State highway projects for which data are given. A grand total of

2,842 parcels involving 6,315 acres of land were investigated, including 2,072 State highway parcels of 1,356 acres, 517 grade-crossing-elimination parcels of 149 acres, and 253 parkway parcels of 4,810 acres. All parcels for which negotiations had not been consummated were excluded.

An outline of the primary methods of public land acquisition for highways, parkways, and grade-crossing eliminations in the State of New York is given in the following paragraphs.

#### THE HIGHWAY LAW <sup>18</sup>

Rights-of-way for State highways must be acquired by the counties and at their own expense. Pursuant to a request by the State, the county board of supervisors, through its right-of-way committee, negotiates for and secures options to purchase highway rights-of-way. Plat maps of the individual parcels to be acquired are furnished the counties without charge by the State. A right of entry by the State and county exists as soon as an agreement is executed. Options are exercised by the county pursuant to special resolutions, deeds are obtained and the awards are paid by the county treasurer. This procedure takes place when the owner and the county can agree on the settlement price. Where difficulties arise, one of the following modes of condemnation may be utilized.<sup>19</sup>

*Commissioner of Appraisal System.*—Any county in the State may use this method of forcible acquisition. Upon petition by the county attorney, pursuant to resolution of the board of supervisors and after notice to the owner, three disinterested freeholders are appointed by the county judge as commissioners of appraisal. Each commissioner is entitled to compensation of \$25 a day and his necessary expenses. Upon

<sup>18</sup> Art. III, secs. 30-36, Highway Law.

<sup>19</sup> Lands for limited-access highways may also be acquired by the counties, in fee simple, either by purchase or by the exercise of the power of eminent domain as in the case of ordinary State highways.

the filing of the oaths of office of these commissioners, title to the lands described in the petition and by a map filed in the office of the county clerk vests in the county, whereupon a right of entry exists. After hearing all the evidence the commissioners make an award and file a report of their findings, which is binding unless one of the parties appeals therefrom. When the State highway department is informed that all necessary properties have been purchased or placed under condemnation, construction may be initiated.

*Court or referee system.*—Eric County is permitted to use a summary method of condemnation. After a copy of the petition and map of the parcel to be condemned are filed with the county clerk and notice has been given the owner and other interested parties the county may enter upon the lands. The proceedings are conducted in the supreme court or before an official referee designated by the court to hear the case and make the award. The court or referee views the premises, hears the testimony, and renders a decision which, upon application of the board of supervisors, can be made final within four months of its rendition. Any number of parcels of land on one or more highway improvements may be joined in the same proceeding.

#### THE STATE-WIDE GRADE CROSSING ELIMINATION ACT

The act applies to all highway-railroad crossing eliminations outside of the cities of New York, Buffalo, and Syracuse. Lands necessary for the elimination of railroad-highway grade crossings are acquired by the State through the Grade Crossing Bureau<sup>20</sup> of the Department of Public Works. After the necessity for the acquisition of lands for a particular grade-crossing elimination has been established, a map of the parcel and description is filed in the office of the Secretary of State and notice to that effect is given the Public Service Commission. Notice to the owner completes the appropriation, title passes to the State, and the State may enter upon the property and begin construction.<sup>21</sup> After careful appraisals are made, the State negotiates a settlement with the owner before actual occupation of the premises takes place. If settlement is not reached, the owner must file a claim for the value of his property in the State Court of Claims within 2 years of the appropriation.

The Constitution of New York authorizes the legislature to create a debt not exceeding \$300,000,000 for grade-crossing elimination.<sup>22</sup> Originally, the cost of an elimination was to be shared 50 percent by the railroad company and 50 percent by the State, of which 10 percent was to be contributed by the minor governmental unit in which the elimination was situated. In 1929, the local units were charged with 1 percent, the State 49 percent, and the railroad 50 percent of the

cost. These cost proportions were again changed in 1938, the railroad's share being reduced to an amount not to exceed 15 percent of the cost. If Federal funds are used for reconstruction of a highway-railroad grade separation structure on the State system, condemnation under the Highway Law is mandatory, and the summary appropriation method applicable ordinarily may not be used.<sup>23</sup>

#### THE SYRACUSE GRADE CROSSING ELIMINATION ACT

The act is an adaptation of the general Grade Crossing Elimination Act to urban uses.<sup>24</sup> The financing of eliminations follows the general act except that the administrative expenses of a special grade crossing commission, represented by special counsel, are city charges. The Public Service Commission determines the necessity of each undertaking and thereafter plans are filed with the city engineer upon approval of the common council. If the Syracuse Commission cannot purchase the necessary lands, it must resort to the machinery of the Condemnation Law, while claims for special additional damages must be made by the owner in the Court of Claims.

#### THE PARKWAY ACTS

Parks and parkways in New York are authorized in a number of separate laws, analyzed in the following paragraphs:

*Taconic State Park Commission Act.*—The Taconic State Park Commission<sup>25</sup> consists of five persons, appointed by the Governor, who receive only their necessary expenses. The commission has the power to establish State parks and parkways, including the Eastern State Parkway, and to acquire lands by purchase or by entry and appropriation under the provisions of the Conservation Law<sup>26</sup> or under the Condemnation Law. The Conservation Law sanctions appropriation, with the approval of the governor, of real property by filing a description with the Secretary of State. When the owner has been notified of such action, title to the property vests in the State, and within 2 years the owner may present his claims for the value of his property to the Court of Claims. Financing is done entirely by the State.

*Westchester County Park Commission as agent for the State.*—The Westchester County Park Commission consists of eight residents of Westchester County appointed by the board of supervisors;<sup>27</sup> and they receive only their necessary expenses. The commission, as agent for the State, has the power to establish and control State parks and parkways, including the Bronx Parkway Extension, in the county of Westchester. In the acquisition of lands for State parkways, the commission operates in the same manner as in the acquisition of lands for county purposes. The commission negotiates with property owners and takes options which must be approved by the board of supervisors.

<sup>20</sup> Ch. 375, Laws of 1939.

<sup>21</sup> Laws of 1928, ch. 825 enacted to revise the Laws of 1926, ch. 439.

<sup>22</sup> Created by ch. 198, Laws of 1925.

<sup>23</sup> Sec. 59.

<sup>24</sup> The Grade Crossing Bureau also acquires lands and property for existing and new State institutions; for bridges and approaches built by the State under special acts of the legislature; for the Whiteface Mountain Highway under ch. 174, Laws of 1938; for the Little Falls Highway under ch. 698, Laws of 1936; for flood control purposes, under ch. 592, Laws of 1939; and for canal purposes under ch. 542, Laws of 1939.

<sup>25</sup> This right of immediate entry and possession is qualified by ch. 101, New York Laws of 1940, which specifies that the State may proceed against the owner or occupant of any lands only at or after the expiration of 30 days from the service of the copy of the description and plat maps and notice of the filing thereof in the office of the department of State; then, the State may proceed in the same manner as in the case of a tenant holding over after the expiration of his term without permission of his landlord, except that such action is to be preceded by 10 days' notice to quit.

<sup>26</sup> Art. 7, sec. 14 as amended in 1925.

<sup>27</sup> Ch. 292, Laws of 1922 amended by ch. 119, Laws of 1925; ch. 226, Laws of 1926; ch. 482, Laws 1927; ch. 444, Laws 1928; ch. 563, Laws 1929; ch. 312 and 561, Laws 1931.

In the event compulsory acquisition is necessary, the commission proceeds with condemnation as under the Highway Law. The Bronx Parkway Extension was financed completely by the State.

#### THE CONDEMNATION LAW

In addition to the provisions indicated under the Highway Law, the Condemnation Law specifies that costs of the proceedings be awarded as follows:<sup>28</sup>

(a) If the award exceeds the offer, an allowance of \$65 is made for court costs and the court may grant an additional amount not exceeding 5 percent of the award.

(b) The property owner is allowed interest at the rate of 6 percent from the institution of proceedings to date of award and 4 percent thereafter to the date of payment.

<sup>28</sup> Sec. 16.

#### MARGINAL LAND ACQUISITION

New York is one of the few States which sanctions the use of the "excess condemnation" device by organic law. Article I, section 7, of the State Constitution provides:

The Legislature may authorize cities and counties to take more land and property than is needed for actual construction in the laying out, widening, extending, or relocating parks, public places, highways or streets; provided, however, that the additional land and property so authorized to be taken shall be no more than sufficient to form suitable building sites abutting on such park, public place, highway or street. After so much of the land and property has been appropriated for such park, public place, highway or street as is needed therefor, the remainder may be sold or leased.

It was introduced as part of the organic law in 1913, and by a subsequent amendment in 1927, it was enlarged to include counties as well as cities.

# TESTS OF CONCRETE CONTAINING FLORIDA "OJUS" ROCK

BY THE DIVISION OF PHYSICAL RESEARCH AND TESTS, PUBLIC ROADS ADMINISTRATION

Reported by W. E. Grieb, Associate Highway Engineer

THE PURPOSE of this investigation was to determine whether aggregate made from the Florida coral formation known as "Ojus" rock is as satisfactory as natural sand and trap rock for use in reinforced concrete exposed to the action of sea water. Because of its quite porous nature, the ability of Ojus rock to protect imbedded reinforcing steel against corrosion by action of salt water has been questioned. The tests were designed to throw light on this particular question and were made by subjecting concrete specimens in which plain steel rods were imbedded to alternate immersions in synthetic sea water followed by drying in air. The amount of protection afforded the steel was determined by breaking open specimens from time to time and noting the condition of the rods.

## TESTS MADE WITH THREE COMBINATIONS OF AGGREGATE AND TWO CEMENTS

Three combinations of aggregate were used in the tests, as follows:

- (a) Trap rock with Lake Wales natural sand as fine aggregate,
- (b) Ojus rock with Ojus rock screenings as fine aggregate,
- (c) Ojus rock with Lake Wales natural sand as fine aggregate.

Each of the above combinations was used with two portland cements, a cement relatively high in computed amount of tricalcium aluminate (C<sub>3</sub>A) and a cement containing virtually no tricalcium aluminate. Both cements passed the A. S. T. M. specifications for portland cement in effect at the time these tests were started. In this report the first cement is identified as type I and the second as type II. Complete chemical analyses of the cements are not available. However, tests on other cements from the same sources indicate that the two cements are properly classified as to type.

The gradings and physical properties of the aggregates are given in table 1 and data for the concrete mixes are given in table 2.

For each of the six combinations of materials from thirteen to fifteen 6- by 12-inch concrete cylinders were made, the number depending upon the amount of material available. All specimens were given an initial curing of 28 days in moist air. Three cylinders from each combination were then tested for compressive strength. The remaining specimens were divided into three groups, as follows:

**Group A.**—Five specimens were cast with each combination of materials, each containing two ½-inch round plain steel rods, 8 inches long. One rod was imbedded in the center of the specimen and equidistant from the ends. The other rod was imbedded half way between the center and the outside and also equidistant from the ends. One rod in each specimen had approximately 3 inches of cover as compared to about 1½ inches of cover for the other. These speci-

mens were alternately immersed in synthetic sea water for 24 hours and dried in laboratory air for 24 hours. They were examined periodically to determine if rust was forming on the rods.

**Group B.**—Three specimens were cast with each combination of materials, each containing two ½-inch round plain steel rods 8 inches long and placed in the specimens in the same manner as those in group A. These specimens were alternately immersed in tap water for 24 hours and dried in laboratory air for 24 hours. They were examined along with the specimens in group A to determine whether rusting was due to sea water.

**Group C.**—From two to four specimens were cast with each combination of materials. These specimens contained no steel and were treated in the same manner as the specimens in group B. They were tested for compressive strength when the final inspection of the specimens in groups A and B was made.

After 200 alternations of wetting and drying, two specimens for each combination of materials from group A and one specimen for each combination from group B were examined for evidence of corrosion of the steel. The specimens were broken open and the steel removed. A slight amount of rust was found on one of the rods taken from a specimen from group A containing type II cement, Lake Wales sand, and Ojus rock. The other specimens appeared to be unaffected.

After 500 alternations, all of the remaining specimens of groups A and B were weighed, the loss in weight

TABLE 1.—Tests of aggregates

	Ojus rock	Trap rock	Ojus sand	Lake Wales sand
Sieve analysis:				
Percent retained on—				
¼-inch sieve.....	0	0	0	0
½-inch sieve.....	67	67	9	1
No. 4 sieve.....	100	100	31	10
No. 8 sieve.....			45	46
No. 16 sieve.....			67	80
No. 30 sieve.....			94	99
No. 50 sieve.....				
No. 100 sieve.....				
Fineness modulus.....			2.46	2.36
Percent absorption.....	4.59		1.5	0.3
Bulk specific gravity.....	2.27	2.91	2.56	2.63
Weight per cubic foot, (dry loose), pounds.....	79	98	96	105

TABLE 2.—Data on concrete proportions

Type cement	Material combination		Proportions by weight	Cement factor	Water-cement ratio	Slump
	Fine aggregate	Coarse aggregate				
I.....	Lake Wales.....	Trap.....	1:2.56:3.46	5.71	4.6	5¼
I.....	Ojus.....	Ojus.....	1:1.97:2.55	6.12	5.7	4¾
I.....	Lake Wales.....	do.....	1:2.25:3.22	5.46	5.5	4¾
II.....	do.....	Trap.....	1:2.56:3.46	5.71	4.6	5½
II.....	Ojus.....	Ojus.....	1:1.97:2.55	6.12	5.7	5
II.....	Lake Wales.....	do.....	1:2.25:3.22	5.46	5.5	4¾



FIGURE 1.—CONDITION OF SPECIMENS MADE WITH TYPE I CEMENT AFTER IMMERSION IN SEA WATER AND DRYING 850 TIMES.

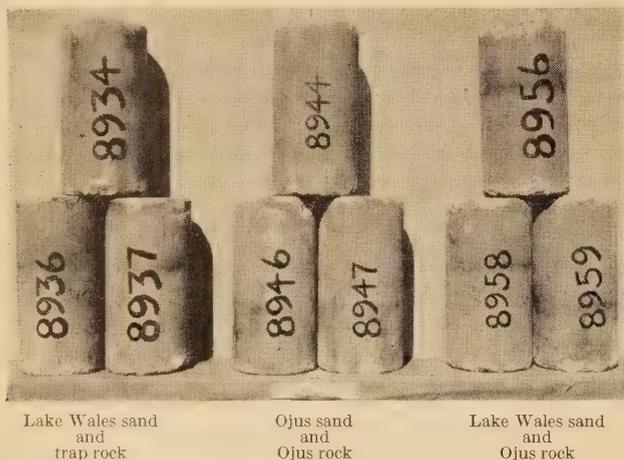


FIGURE 2.—CONDITION OF SPECIMENS MADE WITH TYPE II CEMENT AFTER IMMERSION IN SEA WATER AND DRYING 850 TIMES.

recorded and the specimens examined for evidence of rust on the surface of the concrete. These observations were repeated at the end of 600 and 700 alternations.

At 850 alternations, one specimen from each combination in groups A and B was broken open and the steel examined. Considerable corrosion was noted in all specimens of group A. It was decided to discontinue the treatment and to make the final comparisons on the basis of the action at the end of 850 alternations of wetting and drying. At this point the specimens were approximately 7 years old.

EFFECT OF IMMERSION IN SEA WATER ON THE CONCRETE

The losses in weight of the concrete specimens after 500 and 850 alternations of immersion in sea and in tap water followed by drying in air are shown in table 3. Each result is the average of tests on three specimens. Photographs of the individual specimens after 850 alternations are shown in figures 1 to 4, inclusive. In each figure, the specimens are arranged in three groups, according to aggregates used. The grouping in the photographs is in the same order as in the table, thus facilitating comparisons. In the case of specimens stored in tap water, cylinders from both groups B and C are shown.

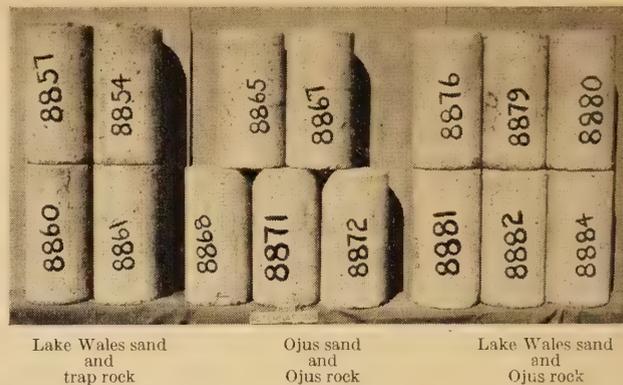


FIGURE 3.—CONDITION OF SPECIMENS MADE WITH TYPE I CEMENT AFTER IMMERSION IN TAP WATER AND DRYING 850 TIMES.

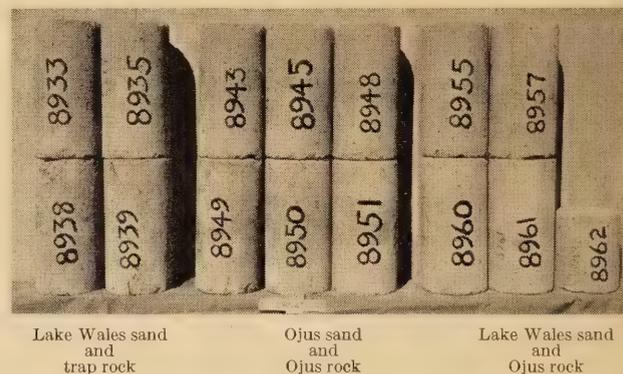
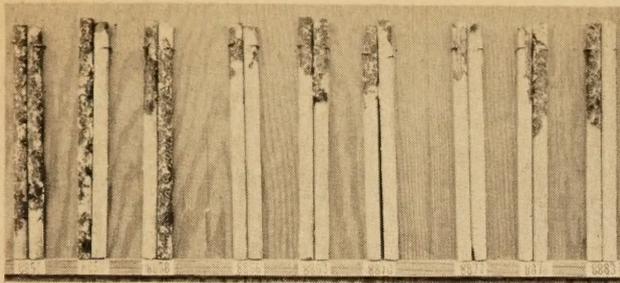


FIGURE 4.—CONDITION OF SPECIMENS MADE WITH TYPE II CEMENT AFTER IMMERSION IN TAP WATER AND DRYING 850 TIMES.

In comparing the weight losses given in table 3 it should be borne in mind that the large amount of handling required in wetting and drying the specimens probably produced some surface abrasion, particularly at the edges. It is believed that this probably accounts for most of the losses shown for the specimens stored in tap water and also for those containing type II cement and stored in sea water. The fact that the specimens made with trap rock showed somewhat

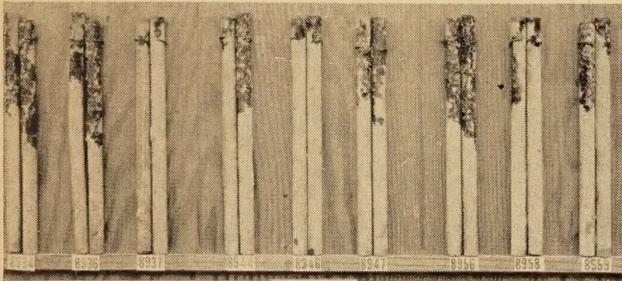
TABLE 3.—Weight losses of concrete specimens after alternate wetting and drying

IMMERSION IN SEA WATER				
Material combination			Percent loss in weight after	
Type of cement	Fine aggregate	Coarse aggregate	500 alternations	850 alternations
I	Lake Wales	Trap	3.0	3.7
I	Ojus	Ojus	3.7	4.8
I	Lake Wales	do	3.8	5.3
II	do	Trap	4	1.0
II	Ojus	Ojus	2.6	3.2
II	Lake Wales	do	1.5	2.1
IMMERSION IN TAP WATER				
I	Lake Wales	Trap	0.9	1.5
I	Ojus	Ojus	1.8	2.7
I	Lake Wales	do	1.8	2.5
II	do	Trap	4	1.2
II	Ojus	Ojus	1.2	2.8
II	Lake Wales	do	1.1	2.6



Lake Wales sand and trap rock      Ojus sand and Ojus rock      Lake Wales sand and Ojus rock

FIGURE 5.—CONDITION OF RODS IN SPECIMENS MADE WITH TYPE I CEMENT AFTER IMMERSION IN SEA WATER AND DRYING 850 TIMES.



Lake Wales sand and trap rock      Ojus sand and Ojus rock      Lake Wales sand and Ojus rock

FIGURE 6.—CONDITION OF RODS IN SPECIMENS MADE WITH TYPE II CEMENT AFTER IMMERSION IN SEA WATER AND DRYING 850 TIMES.

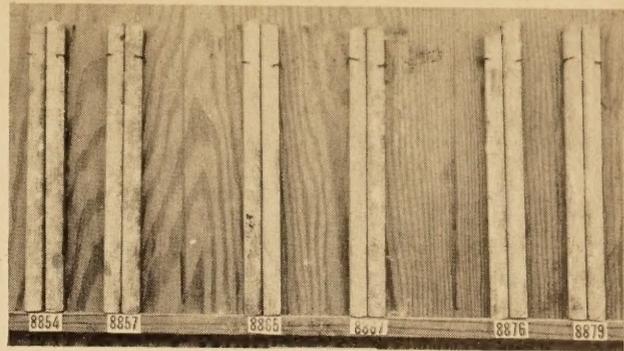
lower weight losses than those made with Ojus rock may be due to the superior hardness of the trap rock aggregate. These differences in weight losses are about the same regardless of the type of exposure.

However, the specimens containing type I cement stored in sea water show considerably higher losses than the corresponding specimens in tap water indicating that, entirely independent of the possible effect of surface abrasion caused by handling, exposure to sea water has had some effect on the specimens containing the type I cement.

**EFFECT OF IMMERSION IN SEA WATER ON THE STEEL**

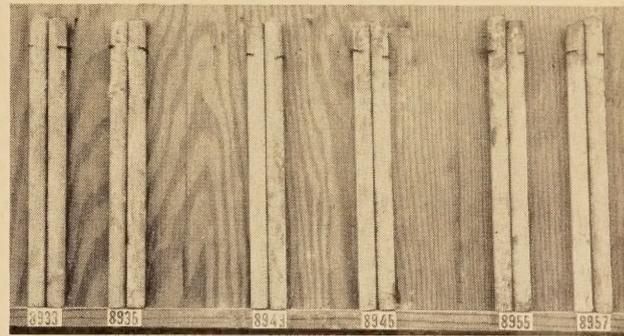
The extent and character of the corrosion that developed on the steel rods during 850 immersions in sea water are given in table 4 and are shown by photographs of the individual bars in figures 5 and 6. In each figure the bars are arranged in three groups of 6 bars each, according to aggregates used in making the cylinders. In each pair the left hand bar was taken from the side of the specimen, the right hand bar from the center. The bars are arranged with the corroded portion at the top without regard to their original positions in the concrete cylinders.

Table 4 and figures 5 and 6 show wide variations in the amount and character of the corrosion developed. For instance, in the first group (type I cement with Lake Wales sand and trap rock), the center rod from one of the specimens showed only 2 percent corrosion as compared to 70 percent for the outside rod. These individual discrepancies are no doubt due to variations



Lake Wales sand and trap rock      Ojus sand and Ojus rock      Lake Wales sand and Ojus rock

FIGURE 7.—CONDITION OF RODS IN SPECIMENS MADE WITH TYPE I CEMENT AFTER IMMERSION IN TAP WATER AND DRYING 850 TIMES.



Lake Wales sand and trap rock      Ojus sand and Ojus rock      Lake Wales sand and Ojus rock

FIGURE 8.—CONDITION OF RODS IN SPECIMENS MADE WITH TYPE II CEMENT AFTER IMMERSION IN TAP WATER AND DRYING 850 TIMES.

in the degree of protection afforded by the concrete adjacent to the steel. This in turn was probably influenced by accidental variations in density. It is significant that, on the average, the concrete containing

TABLE 4.—Condition of steel after 850 alternations of immersion in sea water and drying

Type of cement	Material combination		Steel from side of specimens		Steel from center of specimens		Surface affected average for group
	Fine aggregate	Coarse aggregate	Surface affected	Condition of steel	Surface affected	Condition of steel	
I	Lake Wales	Trap rock	70	Deep pitting	80	Deep pitting	55
			70	do	2	do	
			30	do	75	do	
I	Ojus	Ojus rock	15	do	2	Slight pitting	17
			20	do	25	Deep pitting	
			30	do	10	do	
I	Lake Wales	do	15	Pitting	1	do	13
			5	Rust	15	do	
			40	Deep pitting	0	O. K.	
II	do	Trap rock	15	do	40	Deep pitting	21
			25	do	45	do	
			2	Rust	1	Slight pitting	
II	Ojus	Ojus rock	2	Deep pitting	15	Deep pitting	12
			2	Pitting	3	do	
			20	Deep pitting	30	do	
II	Lake Wales	do	35	do	35	do	17
			10	Pitting	2	do	
			15	Deep pitting	3	do	

TABLE 5.—Crushing strength tests

Material combination			Crushing strength, pounds per square inch	
Type of cement	Fine aggregate	Coarse aggregate	28 days <sup>1</sup>	850 alterna- tions <sup>2</sup>
I	Lake Wales	Trap rock	2,860	3,430
I	Ojus	Ojus rock	3,070	4,140
I	Lake Wales	do.	2,880	4,340
II	do.	Trap rock	3,300	4,440
II	Ojus	Ojus rock	3,240	4,110
II	Lake Wales	do.	3,580	4,340

<sup>1</sup> Average of three specimens.

<sup>2</sup> Average of from two to four specimens approximately 7 years old.

the Ojus rock afforded as much or even somewhat greater protection than the concrete containing Lake Wales sand and trap rock. As a matter of fact the first group shows by far the greatest average attack. The apparent superiority of the type II cement in resisting sea water attack on the surface of the concrete does not hold for the protection of the steel. The type of cement appears to make little difference.

Figures 7 and 8 show the condition of the rods from the specimens immersed in tap water. There is no

evidence of corrosion of the steel other than very slight rusting of one or two of the bars.

The results of strength tests after 28 days moist curing and after 850 alternations of immersion in tap water for 24 hours followed by air drying for 24 hours are shown in table 5. The results are not particularly significant except in showing that there was no retrogression in strength during the 7-year period covered by this test.

#### CONCLUSIONS

The results of these tests indicate:

(1) That concrete containing Ojus rock, either as total aggregate or in combination with Lake Wales sand, is somewhat less resistant to sea water attack than similar concrete containing Lake Wales sand and trap rock.

(2) That concrete containing the type I cement used in these tests is somewhat less resistant to sea water attack than similar concrete containing the type II cement used in the tests.

(3) That concrete containing Ojus rock, either alone or in combination with Lake Wales sand, is as effective in protecting reinforcing steel against sea water attack as is concrete containing Lake Wales sand and trap rock.

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Public Land Acquisition for Highway Purposes. 10 cents.  
Tire Wear and Tire Failures on Various Road Surfaces. 10 cents.  
Public Control of Highway Access and Roadside Development. House Document No. 379. Interregional Highways. 75 cents.

## *DEPARTMENT BULLETINS*

- No. 1279D . . Rural Highway Mileage, Income, and Expenditures, 1921 and 1922. 15 cents.  
No. 1486D . . Highway Bridge Location. 15 cents.

## *TECHNICAL BULLETINS*

- No. 265T . . . Electrical Equipment on Movable Bridges. 35 cents.

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Single copies of the following publications may be obtained from the Public Roads Administration upon request. They cannot be purchased from the Superintendent of Documents.

## *MISCELLANEOUS PUBLICATIONS*

- No. 296MP. . Bibliography on Highway Safety.  
House Document No. 272 . . . Toll Roads and Free Roads.  
Indexes to PUBLIC ROADS, volumes 6, 7, 11, 12, 15, and 17-22, inclusive.

## *SEPARATE REPRINT FROM THE YEARBOOK*

- No. 1036Y . . Road Work on Farm Outlets Needs Skill and Right Equipment.

## *REPORTS IN COOPERATION WITH UNIVERSITY OF ILLINOIS*

- No. 303. . . Solutions for Certain Rectangular Slabs Continuous Over Flexible Support.  
No. 304. . . A Distribution Procedure for the Analysis of Slabs Continuous Over Flexible Beams.  
No. 313. . . Tests of Plaster-Model Slabs Subjected to Concentrated Loads.  
No. 314. . . Tests of Reinforced Concrete Slabs Subjected to Concentrated Loads.  
No. 315. . . Moments in Simple Span Bridge Slabs With Stiffened Edges.  
No. 336. . . Moments in I-Beam Bridges.  
No. 345. . . Ultimate Strength of Reinforced Concrete Beams as Related to the Plasticity Ratio of Concrete.  
No. 346. . . Highway Slab-Bridges with Curbs: Laboratory Tests and Proposed Design Method.

## *UNIFORM VEHICLE CODE*

- Act I.—Uniform Motor Vehicle Administration, Registration, Certificate of Title, and Antitheft Act.  
Act II.—Uniform Motor Vehicle Operators' and Chauffeurs, License Act.  
Act III.—Uniform Motor Vehicle Civil Liability Act.  
Act IV.—Uniform Motor Vehicle Safety Responsibility Act.  
Act V.—Uniform Act Regulating Traffic on Highways.  
Model Traffic Ordinances.

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A complete list of the publications of the Public Roads Administration classified according to subject and including the more important articles in PUBLIC ROADS, may be obtained upon request addressed to Public Roads Administration, Federal Works Bldg., Washington 25, D. C.

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